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Tech Prep and the U.S. Navy

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In preparing for the 21st century, Navy leadership faces both short- and long-term dilemmas. In the short term, how can the Navy make its recruiting mission this year and—if the economic boom continues—in 2001? In the long term, how is the Navy going to attract the technical talent required to serve on the smart ships of the 21st century? CNA has been working with the Navy for the past 2 years on developing a new incentive, built on the federal program called Tech Prep, that overcomes the difficulty of finding time during off-duty hours to attend college. In this document, we provide information about this program, its benefits, and the challenge to the Navy in strengthening and expanding this incentive.

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Contents

Summary

In preparing for the 21st century, Navy leadership faces both short- and long-term dilemmas:

- *In the short term,* how can the Navy make its recruiting mission this year and—if the economic boom continues—in 2001?
- *In the longer term,* how is the Navy going to attract the technical talent required to serve on the smart ships of the 21st century?

Current factors

The current economy is the strongest that U.S. military recruiters have had to compete with since the onset of the All-Volunteer Force in 1973. In this environment, all of the services except the Marine Corps have had difficulty meeting their enlisted recruiting goals. In response to the difficulties, both the Navy and the Army have increased their caps on non-high-school-diploma graduates from 5 to 10 percent of enlisted accessions.

It is unlikely that FY00 is going to be any easier for any of the services. Low unemployment rates continue, and college enrollments are at an all-time high. In 1998, 67 percent of all graduating high school seniors enrolled in either a 2-year or a 4-year college immediately after graduation. This was an 11-percent increase from 1990, and a 36-percent increase from 1980.

Navy leaders, particularly those in the Recruiting Command, must focus on the current recruiting difficulties. Navy ships cannot be unmanned, waiting for a downturn in the business cycle and a rise in civilian unemployment rates. But medium- to long-term factors may ultimately pose even greater challenges.

Medium- to long-term factors

Some of the Navy's programs, most notably the nuclear field, have consistently had requirements for high-quality recruits. Changing technology has transformed the nature of many other enlisted ratings in the past few years, and even greater changes will occur as smart ships start to come on line in the next decade. The Navy will increasingly require fewer Sailors to perform routine tasks, but it will need more high-skilled, technically trained Sailors. In other words, the overall recruiting goal will be lower because of automation, but a higher proportion of recruits will need to be technically prepared and of high quality.

The Navy will find itself in stiff competition with civilian employers for these high-skilled youth. Navy leadership must concentrate on developing a competitive position for the 21st century to meet the increasing requirements for a smart and more technically trained force. Given current college enrollment trends, the main source of these types of recruits may not be the traditional recruiting population of non-college-bound high school seniors. Instead, recruiters must position themselves to attract the youth population that is increasingly interested in higher education.

College incentives

The Navy's current voluntary education incentives do not appear to be adequate to attract the college-bound high school graduates. Part of the reason is that sea duty, deployments, and training requirements make it difficult for young Sailors to find time to pursue a college education. Members in other services do not seem to face these challenges to the same extent. In FY97, over 7 times as many Soldiers and over 9 times as many Airmen as Sailors earned Associate degrees. This is particularly disturbing in light of the recent Youth Attitude Tracking Survey results, which indicate that 33 percent of young men cited pay for future education as the main reason they would consider joining the military—a 15-percent increase from 1993.

The Army is addressing the challenge of recruiting the high-quality college-bound youth with two new college incentives—Army College

First and Green to Grad. Both of these programs are aimed at making it easier for a Soldier to earn an Associate degree within the first enlistment.

To be competitive for this college-bound youth market, the Navy must also create new college incentives that enable Sailors to earn degrees early in their careers. The Navy has recently implemented a new program—the Navy College Program—in part to address this need.

These new Army and Navy programs are innovative programs for increasing the opportunities of servicemembers to earn college degrees, and they have the potential to be attractive to some of the college-bound high school graduates. But most of the current education incentives, including the Navy College Program, require servicemembers to take college courses while on active duty in order to earn a degree. As we have noted, Sailors find it particularly difficult to find enough time to take advantage of current college programs.

CNA has been working with the Navy for the past 2 years on developing a new incentive that overcomes these difficulties. This program, built on the federal program called Tech Prep, allows a Sailor to combine credits awarded for Navy technical training with college credits earned before going on active duty to earn an Associate degree. In other words, recruits front-load college requirements that are not satisfied by Navy technical training *before* going on active duty. This allows the recruit to reduce the time and cost of college, while guaranteeing a degree within 1 to 2 years of going on active duty. This is the only military education incentive to offer such an opportunity.

Tech Prep

Tech Prep is a federally funded program aimed at improving the academic and technical skills of high school students. The most common model is a partnership between a community college and the secondary school divisions within its service region, which forms a Tech Prep consortium. The consortium establishes programs in which high school students explore and pursue a technical career field. These programs are intended to include the last 2 years of high school, to

lead to a 2-year college degree or vocational certificate, and to result in technical job placement.

Tech Prep participation rates are growing across the nation. The most comprehensive survey of participation rates was conducted by Mathematica for the 1994-95 academic year. At that time, 740,000 high school students were participating. This number represented 8 percent of all high school students, and was a fourfold increase from the number participating 2 years before the survey. Because Tech Prep is aimed primarily at the last 2 years of high school, a majority of the participants are high school juniors and seniors. These programs are more prevalent in larger high schools, in suburban areas, and in the Midwest or West.

We estimate that Navy Tech Prep partnerships with consortia that currently have programs could result in as many as 5,000 additional high quality, technically prepared recruits annually. The potential for additional recruits would increase as the nationwide adoption of Tech Prep increases.

In February 1999, the Navy became the first service to form a Tech Prep partnership with a community college consortium. Since the Navy signed its first partnership agreement, over 50 additional partnerships have been signed, including statewide agreements in West Virginia, Oklahoma, Nebraska, and Delaware. These agreements include the nuclear field, the advanced electronics/computer field (AECF), the submarine electronics/computer field (SECF), and the YN, RP, PN, and CTI ratings.

How does the Navy benefit?

- Better quality recruits enter the Navy with some college.
  - — Better prepared recruits may have lower academic and/or Navy attrition.
  - — College credits earned before going on active duty save in Voluntary Education costs.
  - — Training costs could be saved by using Tech Prep as a vehicle for recruiting pretrained people for some ratings.

- The Navy gets long-term help with recruiting.
  - — High schools and colleges work with Navy recruiters to recruit for the Navy program.
  - — This option may be attractive to some of the 67 percent of college-bound seniors.

Colleges and high schools also benefit by these partnerships:

- When unemployment is low, colleges often experience reduced enrollments and/or lower graduation rates. Navy programs can help to increase both.
- When unemployment is high, colleges experience a reduction in their job placement rates. The Navy has a fairly steady recruiting goal, regardless of the economy.

Recommendations

In spite of the number of partnerships that have been created in the past year, just 16 Tech Prep recruits have resulted. CNRC has put a greater emphasis on creating partnerships than on populating the program with recruits. Even so, recruiting personnel are too stretched in their attempts to meet the current recruiting mission to be able to devote adequate time and resources to developing and expanding the Tech Prep program. Navy Tech Prep remains unfunded, and CNRC does not have the resources either to create sufficient supporting materials or to expand the program at a rapid pace.

These Tech Prep partnerships have provided the Navy a unique opportunity. Community colleges are eager to partner with the Navy in recruiting and/or training for *mutually beneficial* outcomes. The goodwill and enthusiasm of college personnel will not be sustained if they perceive that the Navy is not committed to supporting and recruiting for these programs. Benefits accrue to the colleges and to the Navy only when students become enrolled.

To ensure the long-term viability of Navy Tech Prep, we recommend that a steering group be created of representatives from CNRC, N1, CNET, and N7 to coordinate, resolve issues, and secure funding. We provide more details in the main text.

Background

Navy recruiting has become increasingly more difficult. In FY98, CNRC missed the enlisted recruiting goal by 7,000, or 12 percent of mission. It made its goal in FY99, in part because the Secretary of the Navy increased the limit on the percentage of accessions who are non-high-school-diploma graduates (NHSDG) from 5 percent to 10 percent. The military services limit the number of these types of recruits because they generally have much higher attrition than high school graduates. Attrition is costly and ultimately results in higher recruiting and/or retention goals.

The recruiting difficulties can be attributed to a variety of reasons:

- The lowest civilian unemployment rate since the beginning of the All-Volunteer Force in 1973
- A decreased population of veterans
- An overall decrease in the propensity of young people to enlist
- A decreased active duty population
- Increasing college enrollment.

Many of these reasons are outside the Navy's influence, particularly in the near future. Because recruiting has become so difficult, the greatest investment of people and other resources must be in solving the short-term goal of making the mission in FY00-01. But medium- to long-term factors may pose even greater challenges.

Technological change has rapidly transformed the structure of America's workforce. Automation has reduced the overall labor requirements, while an increasing proportion of the remaining workers need to be highly skilled and well educated. For instance, the Bureau of Labor Statistics predicts that jobs that usually require an Associate degree will expand by more than 22 percent between 1996 and 2006,

compared to an overall growth of 14 percent for all jobs in the economy. Further, the Workforce 2020 study found that all of the occupations with increasing job growth will require substantially higher skills than those with declining growth [1].

The Navy is no exception. Changing technology has disproportionately reduced the need for unskilled labor provided by Gendets over the last few years. For instance, in FY86, 18.7 percent of all billets authorized were for Gendets. By FY99, this had fallen to 11.3 percent.[1] At the same time, the requirements for skilled labor have increased. According to the Manpower and Personnel POM-02 Baseline Assessment Memorandum (BAM) Naval Review Board (NRB) (21 January 2000), the Navy is constrained at 69.9 percent of enlisted endstrength in the top six paygrades—E4 to E9—even though manpower billet requirements outline a need for 75 percent. The NRB notes that the discrepancy results from the fact that "technological modernization requires a better trained, more sophisticated work force."

The future will bring about even greater changes in fleet manning, as smart ships start to come on line in the next decade. A recent CNA study concludes that technological advances in 21st-century Navy platforms—both in terms of equipment and systems—will require a more skilled and more technically literate enlisted force with strong problem-solving, decision-making, and communication skills [2]. An analysis provided by the Naval Personnel Research and Development Center helps to illustrate this phenomenon. It predicts that requirements for junior Sailors (E3 and E4) will decrease by 28 percent between 1998 and 2010, and requirements for supervisors (E7 to E9) will decrease by 8 percent; however, requirements for high-skilled, experienced Sailors (E5 and E6) will decrease by only 2.5 percent [3].

Under such a scenario, the overall recruiting goal will be reduced because of automation, but a higher proportion of recruits will need to be technically prepared and of high quality.

1. Source: Enlisted Billet File.

As a consequence, the average cost to recruit each Sailor in the future will most likely be higher than it is today because of the disproportionate increase in the requirements of high-quality recruits. At the same time, the Navy will find itself in stiff competition for these high-skilled youth with civilian employers. Thus, Navy leadership must concentrate on developing a competitive position for the 21st century to meet the challenge of increasing requirements for a smart and more technically trained recruiting force.

But where will the Navy find such technically prepared recruits in the future, and how will it be able to attract them? Creating incentives for the growing college-bound high school graduate market offers the opportunity to expand into this technically prepared yet relatively untapped market. In 1998, 67 percent of all graduating high school seniors enrolled in either a 2-year or a 4-year college immediately after graduation [4]. This was an 11-percent increase from 1990 and a 36-percent increase from 1980 [5]. Of 1998 high school graduates, almost twice as many attended a 4-year college as a 2-year college (41.2 percent versus 24.4 percent, respectively) [4]. The 1999 Youth Attitude Tracking Survey (YATS) results show some promise in this market as well. When young men were asked the main reason for considering joining the military, 33.2 percent said "pay for future education." This was the most frequent response, and was up from just 28.8 percent in 1993—for a 15-percent increase.[2]

College bound high school graduates represent some of the best and most capable in the pool of potential high school recruits for the military services. Some may ultimately be recruited—either as officers after completion of their college degree program, or as college dropouts. As we have discussed in previous research, however, the Navy recruits very few 2-year college graduates into the enlisted ranks [6]. For instance, although there were over 520,000 Associate degree graduates in the 1998-99 academic year [7], the Navy recruited only 316 people with Associate degrees in FY99. Likewise, relatively few of the college dropouts are subsequently recruited. In FY99, only 1,950 recruits entered with some college but less than a degree.[3]

2. Source: 1999 YATS Topline Memorandum.

Several incentives currently exist that provide assistance to Sailors in pursuing postsecondary education, but the fact is that few are able to take advantage of these incentives. For example, the nature of sea duty, deployments, and training requirements makes it difficult for young Sailors to find time for pursuing a college education. Other servicemembers do not seem to face these challenges to the same extent. For instance, in FY97, over 7 times as many Soldiers, and over 9 times as many Airmen, earned Associate degrees compared to Sailors [8]. The Air Force has the Community College of the Air Force for attracting this quality market, and it is part of the reason why so many Airmen are able to earn degrees while on active duty.

The Army is increasingly targeting this high-quality market. In the past 2 years, it has created two new college programs—Army College First and Green to Grad. The Army College First program provides financial assistance for recruits to attend college before going on active duty. The Green to Grad program is for Soldiers in targeted programs who score well on the Armed Services Vocational Aptitude Battery (ASVAB). It provides free tuition, books, and fees for all courses in an Associate degree program, as well as some time during normal duty time to attend classes. Each Soldier is also provided a laptop, printer, and internet account after completion of initial skills training.

Thus, in the medium- to long-term future, the Navy will find itself in greater competition not only from civilian employers for the high-quality youth market but from other military services that have viable, attractive options for obtaining a 2-year degree while on active duty.

The Navy has recently implemented a new program—the Navy College Program—in part to address this need. This new program, in addition to those newly implemented by the Army, indicate that the services realize the need to tap into the college-bound market. Yet all of the current existing educational incentives, including these new ones, require servicemembers either to take courses during off-duty hours or to separate from the service to complete a degree. Keeping in mind the difficulties cited above concerning the obstacles that

3. Source: CNA's Enlisted Master File.

Sailors face in pursuing a degree while on active duty, the Navy may still face difficulty in attracting a significant number of these high-quality recruits.

CNA has been working with the Navy for the past 2 years on developing a new incentive, built on the federal program called Tech Prep, that overcomes the difficulty of finding time during off-duty hours to attend college. In this document, we provide information about this program, its benefits, and the challenges to the Navy in strengthening and expanding this incentive.

What Is Tech Prep?

Origins

A few years ago, CNA first discussed the possibility of combining college and service in the U.S. Navy through the federally funded program called Tech Prep [9]. Tech Prep is part of the federal Carl D. Perkins Vocational and Applied Technical Education Act (PL 105-332).[4] It is a secondary/postsecondary program that links business, industry, labor, government agencies, parents, and community leaders to educational programming to produce a more technically prepared workforce.

In particular, Tech Prep programs provide academic and technical preparation in one of the following career areas: engineering technology, applied science, mechanical/industrial/practical art or trade, agriculture, health, business, or applied economics. These programs of study lead to an Associate degree or a postsecondary certificate in a specific career field as well as employment in the area of study.

Tech Prep consortia

The most common Tech Prep model is a partnership between a community college and the secondary school divisions within its service region, which forms a Tech Prep consortium. The consortium establishes programs in which students, while in high school, are allowed and encouraged to explore and pursue one of the Tech Prep technical career fields. In most of these programs, this preparation starts in the 10th grade. Because it involves the last 2 years of high school, and is intended to lead to a 2-year college degree or vocational certificate, these programs are sometimes referred to as 2 + 2 programs.

4. The first Tech Prep legislation was authorized in 1990. It was amended and reauthorized in 1998.

The latest reauthorization of this federal legislation also requires consortium membership to include business/industry representatives and university partners. Tech Prep programs are then developed between the community college and the secondary schools, employers, and community leaders in the college service region.

The federal government funds Tech Prep at about $100 million per year. Each state receives a portion of that funding, which pays for Tech Prep administrators, conferences, course development, professional development for educators and counselors, and other development efforts. Local consortia apply for Tech Prep funds from the money received by the state from the federal government. Depending on the state, additional funds are made available from state and local funding.

Dual enrollment and articulation agreements

An important part of these partnerships is the provision for high school seniors to earn college credit or advanced placement in college courses upon graduation, either through dual enrollment or articulation agreements. Dual enrollment provides opportunities for students to enroll in courses at the local community college while still in high school. For instance, in one northern Virginia consortium, high school seniors can enroll in a 1-year sequence of courses in English composition and history at their local Northern Virginia Community College campus in lieu of taking their senior-year high school social studies and English courses. These college courses then count toward requirements for high school graduation, as well as earning college credit toward a degree.

Articulation agreements define how high school students can be granted college credit from the local community college (or advanced standing) for courses taken at their local high school. These credits are usually not awarded until the student graduates and completes one full-time semester at the community college. High school students can earn as much as 12 to 15 credits through these agreements.

One of the requirements of Tech Prep is that the program of study lead to an Associate degree or vocational certificate program of at least 2 years in length. Some programs have gone beyond this requirement and have created Tech Prep 2 + 2 + 2 programs, in which the 2-year college program will articulate into the last 2 years of a 4-year Bachelor's degree program.

The employer component of Tech Prep partnerships is often missing or is fairly weak. But the intention of the federal legislation is for employers to work closely with the community colleges in establishing programs that best serve the employer's future workforce requirements. This participation can range from membership on consortium Tech Prep committees, to offering students job shadowing or internship opportunities, to providing the campus with expensive technology that is used to train future employees.

Size of the Tech Prep market

When we first reported on Tech Prep, we noted that statistics concerning participation in Tech Prep nationwide were difficult to obtain. That is still the case. Part of the reason is that each state defines Tech Prep in different ways. For instance, some counties have extensive opportunities for secondary students to pursue vocational or technical studies while in high school, and may even have articulation agreements with local community colleges to award credit for certain courses. However, not every student enrolled could be considered Tech Prep because not all will continue to a community college upon graduation.

We have been able to gather information about Tech Prep participation rates on a national level, as well as the participation rate in a select number of states.

Nationwide

The most comprehensive survey of participation rates has been conducted by Mathematica for the 1994-95 academic year. It reports that, at that time, 740,000 high school students were participating. This number represented 8 percent of all high school students, and was a

fourfold increase from the number participating 2 years before the survey [10]. Because Tech Prep is primarily a 2 + 2 program, a majority of the high school participants would be juniors or seniors.

Tech Prep has not been uniformly adopted and applied throughout the 50 states. For some, the extent ofTech Prep is simply one or two state-level administrators. At the other extreme, some states have established goals for Tech Prep enrollments in all their public secondary schools. Most states are somewhere between these extremes.

A new study of vocational education by the U.S. Department of Education [11] indicates the geographic range of availability of Tech Prep programs across the country. Table 1 summarizes the findings from this report, which are based on the U.S. Department of Labor's National Longitudinal Survey of Youth, 1996-97. These statistics were gathered 3 years ago, so the absolute magnitude of programs is most likely larger. However, the differences in distribution of programs by characteristics likely persist. For instance, Tech Prep programs are more prevalent in larger schools, that are located in suburban areas, and are in the Midwest or West.

Table 1. Percentage of public high schools offering Tech Prep in 1997[a]

Characteristic	Percentage of high schools
Student enrollment	
1-500	40.0
501-1,000	54.6
1,001 or more	59.1
Urban	50.5
Suburban	61.0
Rural	37.6
Northeast	37.8
Midwest	61.9
West	60.3
South	43.2

a. Source: [11].

Another estimate of Tech Prep enrollments comes from Dan Hull and Julie Grevelle of the Center for Occupational Research and Development (CORD), a nonprofit organization that has been involved with Tech Prep activities throughout the nation for many years. In fact, one of the most important support organizations for Tech Prep, the National Tech Prep Network (NTPN) is an organization under CORD. In their book, *Tech Prep: The Next Generation,* they estimate that 4 million students are involved in Tech Prep courses across the nation [12, page 7]. This estimate includes both secondary and postsecondary students, plus those who are enrolled in secondary or even middle school courses that have been developed using Tech Prep funding and guidelines. They note that many of the 4 million do not necessarily realize that they are "Tech Prep" students, so this estimate casts a fairly wide net in the definition of Tech Prep. We will turn now to some statistics from individual states.

State participation rates

Appendix A contains information on Tech Prep participation rates for those states for which we could gather information. Table 2 summarizes these findings.

Table 2. Summary of Tech Prep students or programs

State	Number of students
Florida	7,174 secondary students in 1997-98. This includes 16 percent of all college-bound high school seniors.
Massachusetts	8,000 students in 1997-98. This includes 8 percent of 11th and 12th grade students in participating areas.
New York	41,500 students in 1997-98.
Ohio	Goal of 15 percent of all 11th and 12th graders by 2000.
Pennsylvania	4,197 secondary students in 1997-98.
Tennessee	112 articulated programs.
Texas	134,000 secondary and postsecondary students in 1997-98. This includes 11.4 percent of all 12th grade students.
Virginia	6,623 high school seniors in 19 of 26 consortia in 1998-99.
Fairfax County	23,000 secondary students in 1998-99.
West Virginia	36 percent of 11th graders in lead counties in 1999-00.

Tech Prep is still a relatively new program, and the market will most likely continue to grow. As we stated, the study by Mathematica revealed that the nationwide Tech Prep participation rate increased by 300 percent in the 2-year period between 1992-93 and 1994-95. Our more current sample of selected states shows slightly lower increases in the latter half of this decade. For instance, as we outline in appendix A, the number of secondary students in Tech Prep in Pennsylvania increased 100 percent between the academic years 1995-96 to 1997-98, and total enrollment in Texas increased 165 percent between 1994-95 to 1997-98. Even these more modest rates, applied to the national rate, would indicate that over 1.5 million high school students are currently participating in Tech Prep.

Tech Prep and the Navy

The Navy is a unique employer, which allows for a different type of Tech Prep partnership. In particular, the Navy has an extensive infrastructure devoted to the training and education of Sailors. Much of this training has been evaluated for college credit by the American Council on Education (ACE).[5] Although many employers offer some type of training, few have programs as extensive and comprehensive. As a result, the Navy can benefit fromTech Prep in two ways.

Models

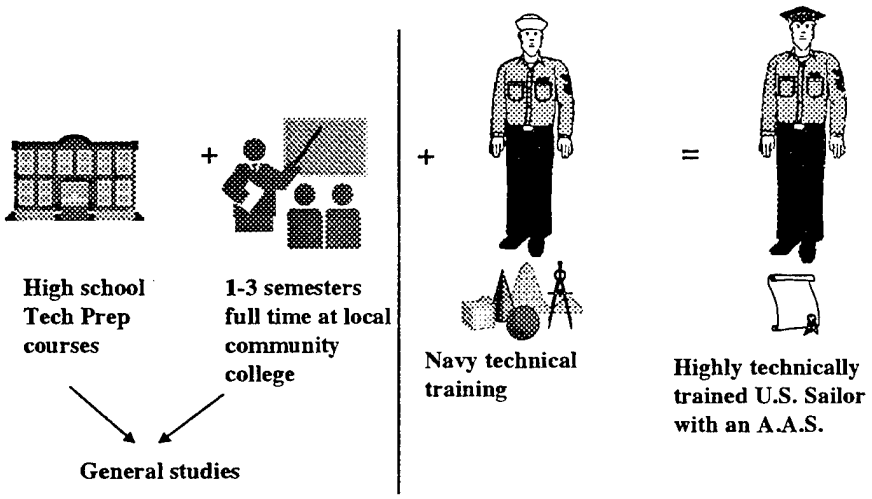
A model based on credit for Navy training

The first model (see figure 1) pertains to those Navy ratings that have lengthy technical training pipelines but cannot be duplicated by civilian institutions—perhaps because the training is Navy-specific or because of the classified nature of the training. For these ratings, articulation agreements provide for awarding college credit for Navy training based on ACE recommendations as part of the degree requirements. The colleges then formulate degree paths for those who will ultimately be trained in that rating, identifying additional courses that would be required to earn Associate degrees. By knowing this information before joining the Navy—perhaps as early as the junior year in high school—any additional course work that will not be fulfilled by Navy technical training can be completed *before going on active duty.* Depending on the standard practices of the consortium, part of the non-Navy degree requirements can be accomplished even

5. ACE is the nation's coordinating higher education association. Part of its function is to evaluate education and training from nontraditional sources, such as the military and industry. The recommended credits from these evaluations ensure a standard required by postsecondary institutions in rewarding college credit for nontraditional learning.

before high school graduation. In this model, education received in high school, the community college, and the Navy are combined to fulfill the requirements for an Associate degree.

Figure 1. Basic Navy Tech Prep model



When does the student begin?

Specifically, the student begins his or her Tech Prep - Navy program by following a prescribed high school course of study, which will vary depending on the career field/rating chosen, as well as the individual consortium's requirements (which in turn may be mandated by state requirements). For some consortia, the student will be able to begin earning college credits before graduating from high school. Upon graduation, the student enrolls full-time at the community college to complete the degree requirements that will not be fulfilled by Navy technical training. For more technical ratings, this may only require one additional semester, and these courses will comprise mostly general education requirements because the technical component of the degree will be provided by Navy training.

For less technical ratings, this will probably require as much as three additional full-time semesters and will include both general education and technical courses.

Upon completion of the college residency requirements, the student goes on active duty. After graduating from initial skills pipeline training, the Sailor applies for credit to the community college for this training, which satisfies all remaining degree requirements. In some cases, all degree requirements may not be satisfied until the Sailor is promoted to E4, which typically also is recommended for college credits by ACE.

This type of model, in which college credit is awarded for Navy technical training, can be applied to all Navy ratings, even if the training is not classified or lengthy. Because college credit is awarded for Navy technical training, the recruit spends less money on tuition and less time "unemployed" before joining the Navy. The longer the Navy training, the more the recruit can "earn while he or she learns." And, by going on active duty before completion of the degree, the Navy is preempting competition with civilian companies for graduates. Depending on the field, college graduates can command much higher starting salaries than those with just some college, and civilian companies typically pay higher starting salaries than the military.

Finally, by incorporating Navy training as part of the degree requirements, the Sailor has a greater incentive to complete Navy technical training. In addition to all of the other incentives to complete training, such as large enlistment bonuses and perhaps promotion, the Navy Tech Prep Sailor also has the incentive of earning an A.A.S. And a recruit can be virtually guaranteed an Associate degree within 2 years of going on active duty as long as he or she completes the training pipeline in the rating guaranteed at accession. No other current military education incentive provides all of these benefits.

When does the student obligate?

Different Navy training pipelines have different college credits associated with them, so the student will need to become a recruit with a guaranteed A-school and pursue the college courses while in the Delayed Entry Program (DEP). But when is the right time to obligate? It depends on several issues. For instance, if the person is interested in pursuing a degree in electronics, he or she may be qualified for the nuclear field or the advanced electronics/computer field (AECF). These programs would require the least number of college courses;

therefore, it would be important for the person to know early on which courses to take. It would also be important to know fairly early whether he or she is qualified for this field. Although the student may have an interest and may be able to pursue an electronics career in the civilian sector, he or she may not qualify for the Navy because of entrance requirements, such as citizenship, moral background issues, or color blindness, to mention a few.

On the other hand, for students who are interested in less technical ratings that will require more college courses taken before going on active duty, there is less urgency in determining whether the person is qualified for the Navy. For either type of rating, relatively little additional time is required on the part of recruiting personnel. Once articulation agreements are established and published, Navy recruiters need to do little more than discuss this option when they make presentations to high school classes. As we will discuss later, some of the recruiting awareness that is done for these Navy Tech Prep programs will be done by non-Navy personnel.

A model based on recruiting pretrained

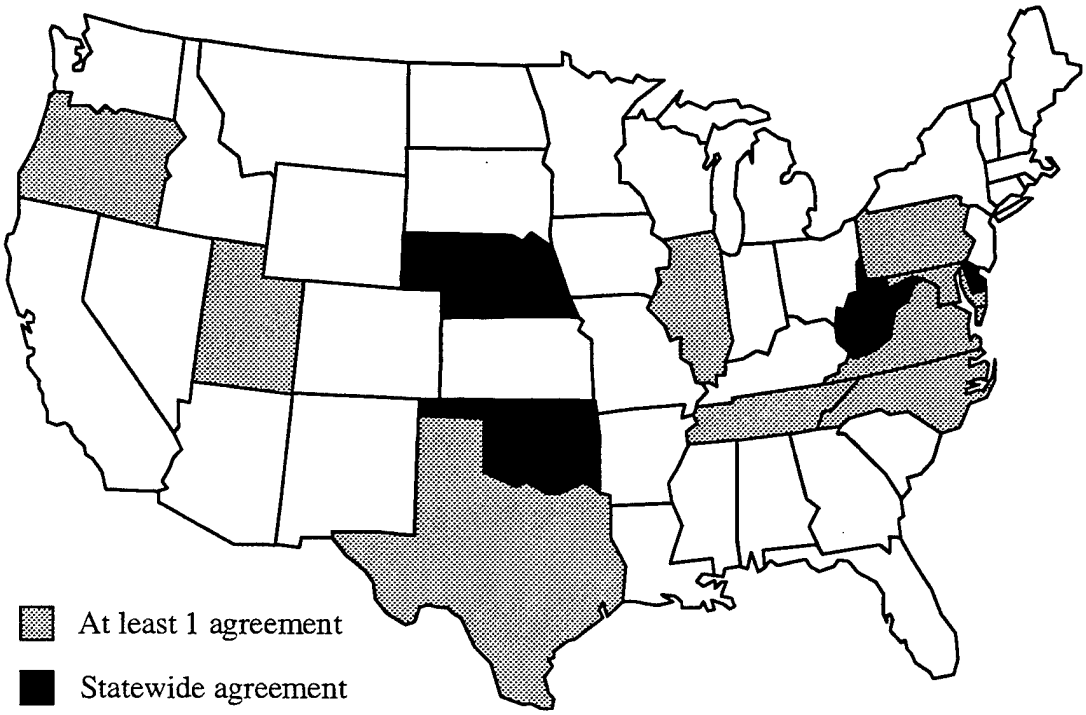
The second way for the Navy to benefit by Tech Prep is to follow the more standard Tech Prep model, in which employers hire the Tech Prep college *graduates*. This method has potential to save the Navy in training costs in fields with little or no Navy-specific training, if the civilian training can be substituted for Navy training. Examples include recruits with Associate degrees in Computer Network Administration, certain allied health fields, or electronics. CNA has discussed the costs and benefits of various options for recruiting pretrained individuals in previous studies [e.g., 9, 13, 14]. Recruiting pretrained people requires a system in which the Navy can assess the technical skills of new recruits and determine which components of training need not be repeated. If an entire A-school or C-school cannot be eliminated, some mechanism would need to be put into place in which the different components of these schools are separated into modules, and new recruits are required to complete only those modules that have not been covered by civilian training.

Models in practice

Tech Prep agreements

When CNA first wrote about the potential of Tech Prep for meeting the Navy recruiting's mission, Tech Prep was still in its early stages of implementation throughout the nation; at that time, no military service had ever created a partnership with a Tech Prep consortium. Since then, the Navy has entered into the first military Tech Prep partnership—with Mountain Empire Community College in western Virginia. This articulation agreement was signed in February 1999 at the Virginia State Tech Prep Conference. Since that time, over 50 agreements have been signed, including four state-wide agreements covering all Associate-degree-granting public colleges in West Virginia, Oklahoma, Nebraska, and Deleware. Appendix B contains a list of colleges that have either signed agreements or are currently reviewing agreements, and figure 2 shows the geographic distribution of the Navy's current Tech Prep partnerships.

Figure 2. Geographic distribution of Navy sTech Prep agreements



Until late November 1999, all of the agreements covered just two Navy enlisted technical fields—the nuclear field and the advanced electronics/computing field (AECF).[6] These two fields were selected for the first agreements because they had the most credits recommended by ACE and had large annual recruiting goals (about 8,000 each year combined). A copy of one of the articulation agreements is available in appendix C.[7]

Most of the NF and AECF agreements provide for the Sailor to earn an A.A.S. in Electronics Engineering Technology (for all AECF ratings and the NF EM and ET ratings) or Manufacturing Technology (for the NF Machinist Mate rating). In some cases, the degree is in Technical Studies.

As a consequence of the credits being awarded by the college for this Navy training, students are required to take only 25 to 35 credits before joining the Navy. Because students can earn college credits while still in high school, these credits usually can be earned by the January following high school graduation.

The following are some of the common features of these NF and AECF agreements:

- *A requirement that students take some college electronics theory courses.* The reasoning is twofold. First, ACE recommends only 3 credits in AC and 3 credits in DC theory for the initial pipeline training in these ratings. Most colleges have a 4-credit requirement in these topics, and the consensus is that the theory is what is lacking between what they offer and what the Sailors receive. In addition, without some resident electronics requirement, colleges are reluctant to award a degree in electronics without the Sailor ever taking an electronics course from one of their faculty.

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6. West Virginia has a general agreement that fits any Navy rating. Walters State Community College was the first college to propose a specific Navy Tech Prep degree path for the ET,FT, STS, and MT submarine ratings.

7. In the past 6 months, agreements have been approved that cover the Yeoman (YN), Religious Programs (RP), Personnelman (PN) and Cryptologic Technician Interpretive (CTI) ratings, and the submarine electronics/computer field (SECF).

- *A required college-level algebra or precalculus math course.* Even though Sailors receive training in college-level math, it typically does not satisfy the level of rigor required by the colleges for a degree.
- *A 25-percent residency requirement.* This is a standard requirement of most colleges, in terms of accepting transfer credits from other institutions.
- *A requirement that the Sailor provide the college with formal documentation of completion of Navy training.* This seems to be most easily accomplished with the Sailor requesting that a copy of his or her SMART[8] transcript be sent to the college.
- *A requirement that the Navy notify the college of significant changes in the Navy training curriculum.*
- *A biannual review of the curriculum and degree requirements.*
- *A requirement that the Navy notify the college when a Sailor attrites or no longer is eligible for the training program.*

The first two requirements should prove to be quite beneficial to the Navy. Tech Prep Sailors will begin their rigorous NF and AECF technical training with college-level math and electronics theory knowledge. This might lower their academic attrition. This requirement can benefit in two other ways. One, if the individual isn't quite sure whether a career in electronics is what he or she is interested in, or if the individual does not have the aptitude for this field of study, these courses should serve as a weeding-out process. This is at the student's expense, and not the Navy's, contrary to the weeding-out that occurs during Navy technical training. In addition, completion of these courses may improve the student's ability to score well on the ASVAB and, therefore, may increase the pool of qualified applicants for both fields.[9]

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8. Sailor/Marine American Council on Education Registry Transcript (SMART) is an electronic document specifying ACE-recommended college credit for military training and occupational experience. For most purposes, a SMART transcript can substitute for the DD295, the Application for Evaluation of Learning Experiences during Military Service.
9. An individual who is not in DEP may retake the ASVAB no sooner than one month after the first test. Students who are interested in the Navy but whose ASVAB scores are not adequate to qualify for the program may want to retest after completing the college courses before enlisting.

Implementation issues

As each new agreement was being negotiated and new recruits were being identified, some issues that arose were addressed, but some issues still remain. For instance, in the very early stages, a mechanism for identifying these recruits needed to be established. This was resolved by adding a new code for these recruits in PRIDE. Also, CNRC had to establish a standard operating procedure for how agreements should be processed, which is still not well understood by the recruiting field. As a part of each agreement, the Navy agrees to notify each college of significant changes in relevant training, the mechanism for which has not yet been established.

Perhaps most important is the need to ensure that a person in the Delayed Entry Program (DEPer) is taking the proper college-based requirements before going on active duty. This is particularly important for those who have been recruited for the nuclear field. Currently, an NF DEPer is not provided with a guarantee of a particular rating. However, the college-based requirements for those in the ET or EM rating are almost completely different from those in the MM rating. For instance, most of the Navy Tech Prep colleges will award an A.A.S. in Electronics Engineering Technology (or an equivalent) for either the NF ET or EM rating, or any of the AECF ratings. For NF MMs, the degree is in Manufacturing Technology or Technical Studies. There is little overlap in the college-required courses between the two degrees. All parties lose if a recruit fulfills the college-based requirements for an electronics degree but is subsequently trained as an NF MM. He or she does not receive the degree long anticipated and must take more courses while on active duty in order to earn a degree; the college loses the anticipated graduate, and the Navy has an unhappy Sailor.

Hence, a new mechanism must be put into place that allows DEPers to know which degree path to pursue early in their Navy Tech Prep program. As the number of ratings and recruits for Tech Prep expands, additional safeguards may need to be put into place.

Benefits

We have already presented some of the major reasons whyTech Prep is beneficial to Navy recruiting. In summary, it is an enlistment program that may benefit Navy recruiting in attracting the high-quality, technically prepared recruits that will be required to serve on the smart ships of the next century. These youth are increasingly interested in postsecondary education, and Tech Prep is a unique opportunity for them to combine military service and earning a college degree. In this subsection, we outline additional reasons why Tech Prep is good for the Navy as well as the education partners.

Training and education issues

Having a well-educated fleet of enlisted Sailors has some very obvious, and some not so obvious, benefits. A recent CNA study found that the returns to the Navy for investments in voluntary education are significant, in terms of both retention and faster promotion. For instance, the first-term reenlistment rate of Sailors who do not earn any college credit while on active duty is 31 percent. For those who earn 15 credits, the reenlistment rate increases to 37 percent. And for those who earn 60 credits—approximately equivalent to earning an Associate degree, the reenlistment rate is 55 percent. This study calculated that, for every dollar spent on voluntary education for college credits, the return in terms of retention is slightly over $1 for Technology PACE and $2 for tuition assistance and instructor PACE (Program for Afloat Education). But the study also pointed out that only 18 percent of the active duty force participated in VOLED in FY97 [15].

As we noted previously, many programs exist in the Navy for pursuing a college degree, such as tuition assistance, Service Members Opportunity Colleges - Navy (SOCNAV), PACE, the new Navy College Program, the Navy College Fund, and the Montgomery GI Bill. The first four programs assist Sailors pursuing postsecondary education while on active duty, and the last two, while possible to utilize while on active duty, are more beneficial in helping people pursue a college education after separating from the service.

Tech Prep provides another opportunity for Sailors to earn Associate degrees while on active duty. But as we have already noted, Tech Prep is a unique program in which Navy recruits can "front load" their college courses before going on active duty. This benefits both the Sailor and the Navy. The more college credits associated with the training, which typically is correlated with the length and degree of technical difficulty of the Navy training, the fewer college courses the individual will be required to take before going on active duty. This means that less tuition will need to be paid and less time spent in full-time studies with loss of income, and so on. While in training in the Navy, Sailors are not only learning and earning college credit but also receiving full pay and benefits.

The Navy benefits in a number of ways. First, Tech Prep Sailors will enter the Navy with some college-level education. This preparation has the potential of reducing Navy academic setbacks and attrition. Second, if the individual earned a comparable number of credits while on active duty using tuition assistance or PACE, some or all of the tuition would be paid for by the Navy. Instead, these Tech Prep Sailors pay for the college credits themselves, thus costing the Navy nothing in terms of voluntary education funds. So, the Navy may be able to reduce costly academic attrition for little or no cost.

As we note later on, many community colleges want to use their Navy Tech Prep agreements as a blueprint for active duty Sailors in a type of "reverse Tech Prep." In this way, active duty Sailors, and recruiters especially, will have additional opportunities to earn Associate degrees while on active duty.

Finally, based on the results of the study cited previously, if Tech Prep has a positive effect on the ability of Sailors to earn degrees while on active duty, it will have beneficial returns in terms of retention.

Recruiting benefits

Tech Prep adds another recruiting tool for recruiters to use in the high schools, potentially increasing the market of high school recruits to include those juniors and seniors who are seriously considering college. In other words, it expands the Navy's recruiting efforts

to include some of the 67 percent who currently attend college to the exclusion of military service.

Recruiting potential

Just how many additional recruits could a fully supported Navy Tech Prep program provide? Because these are new partnerships, we cannot draw on historical data for an estimate. Instead, we provide a range of potential recruits based on the following facts:

- There are approximately 2.8 million high school graduates each year [4].
  - — Of these, 33 percent (924,000) are not college bound.
  - — Of these, at least 20 percent are unqualified for military service based on AFQT scores alone (the number would be more if we included medical, physical or moral disqualifications).[10] This leaves 739,000 potential recruits. Of these, about half (369,000) are males.
- In FY99, the Navy recruited roughly 31,000 male and 7,500 female high school graduates with no college experience.[11] This translates to 8.4 percent (31,000/369,000) of the annual male, and 2 percent (7,500/369,000) of the female, flow of new non-college-bound high school graduates.
- We estimate that 12 percent (336,000) of all graduating seniors are enrolled inTech Prep.[12] About half of these (168,000) are male.

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10. This is based on the fact that the AFQT is a normalized test score. In the 1970 norming of the ASVAB, 20 percent of high school students who took the ASVAB scored below 31 on the AFQT.
11. These are accessions with no more than 12 years of education, and a DOD education code of L, taken from CNA's Enlisted Master File.
12. As we reported earlier, the Mathematica study of the 1994-95 academic year found that roughly 8 percent of all high school students were enrolled in Tech Prep, with a majority being juniors and seniors. If all of the Tech Prep students were evenly divided between juniors and seniors, roughly 16 percent of all graduating seniors would be in Tech Prep. The 12-percent estimate is the average of 8 and 16 percent.

It seems plausible that the enlistment rate of Tech Prep high school graduates would be lower than that of the non-college-bound graduates. A precise estimate of their propensity is beyond the scope of this study. However, table 3 provides an estimate of the number of potential additional Tech Prep recruits based on two levels of propensity. The first assumes that Tech Prep graduates have a propensity to enlist in the Navy that is one-fourth that of non-college-bound high school graduates calculated above, and the second assumes a propensity that is one-third that of the reference group.

Table 3. Potential Tech Prep recruits

	One-fourth	One-third
Males	3,528	4,704
Females	861	1,148
Total	4,389	5,852

These estimates require further elaboration. First, they are based on the assumption that the current Tech Prep participation of high school seniors is about 12 percent. As we have noted previously, Tech Prep participation has been increasing significantly throughout the 1990s. Thus, as participation rates increase across the country, so would the number of potential recruits.

Second, these estimates are based on the assumption that the Navy establishes partnerships with most or all of the high schools that have active Tech Prep programs (which is currently approximately 50 percent of all public high schools). This would require that the Navy expand to include more than the limited number of ratings and programs currently established.

Third, these are estimates of long-term benefits. In other words, because Tech Prep programs typically begin in the 10th grade, most students beginning a Navy Tech Prep pipeline will not be available to go on active duty for at least 2.5 years. It is possible to obtain Tech Prep recruits earlier by recruiting high school students who have been pursuing a Tech Prep path in a related field, or who are enrolled

in a community college; in the long run, however, these sources may be relatively small compared to the more traditional pipeline source.

Finally, these estimates are for potential additional Tech Prep recruits only, and do not include an estimate of non-Tech Prep recruits that may result from better access to both high school and college students as a consequence of these partnerships. These secondary benefits may accrue because Tech Prep is not just a good program for the Navy. High schools and colleges benefit from these partnerships as well. Because everyone benefits, all parties participate in the recruiting of students for the Navy. We'll explain how the educational institutions benefit.

High schools

High school guidance counselors are typically more interested in guiding high school students toward college than to a military career. Navy Tech Prep programs provide an opportunity for the guidance counselor to recommend that a student do both.[13] With Navy recruiting personnel and the guidance counselor working together, these programs could enhance the Navy's opportunities to recruit in the high school, such as increasing the number of students taking the ASVAB, greater participation in career events, and so on.

Colleges

Colleges benefit because of the increased enrollments cited above. When unemployment is low, as it is currently, colleges often struggle with maintaining enrollments and graduation rates. In a good economy, more jobs are available that do not require advanced degrees. So, some people who otherwise might have enrolled enter the workforce instead, or else they take only a few courses that they feel will increase their skills. Colleges are funded, in part, by the number of graduates in a particular field. If the field of study does not have a minimum number of graduates per year, they risk losing funding and

13. It is possible that some of the 33 percent currently not considering college may choose the Navy program. Hence, the total number of graduates attending college may increase because of partnering with the Navy, though these numbers would most likely be very small.

are forced to eliminate that field of study, including faculty positions. And the dropout rate for 2-year colleges is a significant concern to college administrators. In 1997, the 2-year college dropout rate hit an all-time high of 44.6 percent [16].[14]

When unemployment is relatively high, Tech Prep partnerships with the Navy also benefit the college. One of the federal requirements of Tech Prep is that the degree lead to technical employment. The Navy is one of the largest technical employers, with a fairly steady number of openings each year—regardless of the unemployment rate.

Another requirement of Tech Prep is employer involvement in partnerships. As we stated earlier, this has been lacking in many Tech Prep programs across the nation. The Navy has the potential to be a fairly active employer, especially if reserve units can also be encouraged to participate. Such involvement can include tours of Navy facilities, Navy participation in consortia summer camps, and tutoring of students—both in the high schools and on college campuses.

Increasingly more community colleges are seeking to expand their distance learning capabilities and market. By creating Navy-specific degree paths under Tech Prep, colleges can benefit by "reverse Tech Prep," in which active duty Sailors who did not fulfill the requirements for a degree before going on active duty may do so with any of the participating Navy Tech Prep colleges that offer the courses in a distance learning environment. In essence, this expands the number of colleges from which active duty Sailors can earn Associate degrees while on active duty, and it benefits the college by providing access to the population of active duty Sailors who are interested in pursuing postsecondary education.

Finally, colleges apply for funding for Tech Prep programs at the state level. These funds support development of new programs or new curricula. Partnering with the Navy provides the opportunity for additional Tech Prep funding to support these new efforts.

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14. This is the percentage of first-year students who do not return for the second year.

The current status of Navy Tech Prep

As we have noted, the Navy has formed Tech Prep partnerships with over 50 community colleges in 18 months. The Navy has benefited from these partnerships in many indirect ways. For instance:

- West Virginia is providing statewide support for these partnerships.
  - — The articulation agreement was signed by the governor, in a ceremony held in his chambers.
  - — Since the formalization of the agreement, the state has created and printed over 10,000 trifold recruiting brochures to advertise the program, *at no expense to the Navy.* These brochures have been distributed to all secondary school guidance counselors.
  - — All students in the 9th grade will be aware of the Navy program because it has been included as a major within the technology cluster. All students are required to choose a major by the end of the 10th grade.
  - — The governor's appointed Joint Commission for Technical-Vocational-Occupational Education is considering administering the ASVAB to all 10th and 12th grade students in the state, in part to support these partnerships [17].
- Both Mountain Empire Community College and San Antonio Community College have identified students currently enrolled in their colleges who might be interested in these programs, and have made it possible for these students to meet with Navy recruiters.
- San Antonio Community College provided the names and addresses of thousands of high school and college students to the Navy to support the Tech Prep initiative. In addition, they provided a list of 20,000 college dropouts.
- The state of Texas has devoted Tech Prep funds for a full-time position at Central Texas College that has been established to create more degree paths for Navy Tech Prep partnerships.

Specifically, the goal of the position is to coordinate the development of up to 15 Tech Prep A.A.S. degree programs in all 54 public community and technical colleges inTexas [18].

- Articles about the Navy's partnership with Mountain Empire Community College have been included in Virginia's newsletter of the Virginia Community College System, which is disseminated throughout the state's postsecondary community [19], and the Virginia State Tech Prep Coordinator submitted articles about the Navy partnership to *Techniques*, a monthly magazine of the Association for Career and Technical Education (ACTE), and to *Connections*, a publication of the National Tech Prep Network (NTPN). In addition, the articulation agreement with Mountain Empire Community College is highlighted in two different months of the year 2000Tech Prep in Virginia calendar. This calendar is distributed to both secondary and postsecondary Tech Prep personnel throughout the state. Again, this is advertising for the Navy, but at no expense to the Navy.

The response has been impressive, and the significance of this accomplishment should not be underestimated. Each one of these partnerships has created a seamless continuum in a technical college degree program of study, in which the college provides the technical prerequisites, and the college recognizes and certifies that Navy technical training provides advanced technical training that is comparable to its own.

These agreements are unique in another aspect. They provide a delineated program of study, clearly identifying what courses each recruit, or active duty Sailor, in a particular rating will need to accomplish to earn an Associate degree from that institution. No comparable program exists in the Navy in which all Sailors have a clearly defined program of study for a particular degree at a particular school, which the student can have access to before he or she ever enrolls in the particular college. The closest program in existence in the Navy to this Tech Prep model is SOCNAV, but the Tech Prep model has several benefits that SOCNAV does not. For instance, under SOCNAV, a Sailor must take two courses with the participating college before it will officially review his or her Navy training and

college transcripts. After taking the courses, an individual program of study will be established for the Sailor, delineating which courses will be required to earn a particular degree with that college. For most SOCNAV colleges, no standard blueprint exists for Sailors to reference before taking these two courses. And it is possible for Sailors with very similar training experiences to have differing amounts of credit awarded by the college.

The credits awarded by SOCNAV colleges for Navy technical training in the Tech Prep agreements are typically greater than those awarded under a standard SOCNAV agreement. For instance, in our original discussions with Tidewater Community College (TCC) electronics faculty in July 1998, we were told that TCC typically awards only about 15 credits for Sailors who have completed the AECF training pipeline. In contrast, TCC is granting 31 credits for all AECF and NF Sailors in the Tech Prep articulation agreement.

Equally important is the fact that each of these partnerships opens up new opportunities for the Navy to tap into the high-quality, technically prepared recruiting market that will be so important for future fleet requirements.

Expansion to other ratings

Several CNRC Education Specialists have been working with colleges to expand the scope of Navy Tech Prep partnerships to include more ratings, as we have noted previously. Efforts are also under way to create agreements for the Information Technology (IT) rating.

The IT rating actually fits well with both of the Tech Prep models outlined previously. Under a new IT University Pilot Project, the Navy is training 20 recent IT A-school graduates plus 5 mid-career Sailors for a 1-year program in Norfolk that is being taught by Tidewater Community College. This program is a compressed Associate degree program, combining both general education and IT-specific technical courses. At the completion of this course, the Sailors will receive at least one NEC and an A.A.S. in network administration.

In the first type of Tech Prep model, in which the Navy provides the technical component of the training, Tech Prep partnerships can be

formed in which recruits enter with all of the general education, and some pertinent IT-preparatory courses, thus saving as much as one-third of the 52-week proposed training pipeline.

Perhaps a more promising model for the IT rating is to create Tech Prep partnerships in which all of the training is provided by the civilian institution. This is the more standard civilian Tech Prep model, but currently cannot be easily incorporated into the Navy's standard operating procedures. In particular, the greatest benefit to the Navy in using this model would be in saving training time and costs by acknowledging the civilian training, thus getting IT-trained Sailors to the fleet faster and in a less expensive method. There are several constraints to doing this, however. About 75 percent of the current 12-week IT A-school curriculum will also be covered in the proposed IT Associate degree pilot program with Tidewater Community College.[15] The A-school does not consist of individual modules, which would make it possible for those in the pilot project to enroll only in nonredundant modules. Also, currently there are no provisions for individuals who would enter with some training in certain aspects of the curriculum to have their competency evaluated and then trained in only those components for which they are not deemed to be adequately trained. The same is true of the NECs that will be covered by this pilot program.

Another current constraint to this being a viable recruiting Tech Prep program is the fact that graduates with A.A.S. degrees in network administration typically do not have difficulty in finding jobs—particularly positions that pay significantly more than what an E3 would earn.[16] To be attractive, the Navy would have to offer these students, before they begin an intensive job search (usually the fall before graduation), some lucrative enlistment incentive. However, the Navy does not offer enlistment incentives to ratings that do not have difficulty in meeting recruiting goals, as is the case with the IT rating. The difference in this case is that the Navy would not be

15. Source: discussions with N132D6, the IT Enlisted Community Manager.

16. Navy policy is that anyone with 45 semester hours or more of college credit be accessed as an E3.

providing the training for these individuals, but rather benefiting by recruiting those with skills and training in hand.

Potentially dozens of rating/degree paths could be created for future Navy partnerships. The process requires working closely with a college that has identified an interest in a particular field, creating the proper agreement with input from both CNRC and N13 personnel, and, once approved, using the agreement as a template for other colleges. But determining which are the best ratings to pursue requires the Navy to establish priorities. In other words, should early efforts be devoted to fields in which the most recruits are required each year? Or should the emphasis be on fields where the greatest training costs could be avoided by recruiting pre-trained people? Should the priority be on ratings with the most college credits associated with training and/or promotion? In practice, the order may be more a function of the desires of the colleges. But there is no reason why, ultimately, most Navy ratings can't be included in such agreements. Obviously, those ratings with relatively few college credits associated with training or promotion will require the most time spent enrolled at the community college, but they may also be the ratings that have relatively little difficulty in meeting recruiting goals, such as the mess and supply ratings.

A DEP incentive

Numerous programs are available to assist active duty Sailors or veterans with college tuition and fees, such as tuition assistance, PACE, the Montgomery GI Bill, and the Navy College Fund. Because of legislative prohibitions, no incentive exists to provide financial assistance to Navy enlisted recruits to pursue a college education *before* going on active duty.[17] However, CNRC will be submitting a proposal for a college DEP loan/scholarship incentive as part of the FY02 Unified Legislative and Budgeting (ULB) process. We have worked with CNRC on creating this incentive, and below we provide some recommendations related to the implementation of this incentive. But first, we provide a brief summary of this incentive.

17. The Army has a new program called Army College First, which allows that service to pay recruits to attend college while in DEP.

Under a DEP college loan/scholarship program, the Navy would provide funding for each person in DEP in specified ratings or programs to pursue full-time college enrollment. The person would have to be in DEP to be awarded the incentive, and would have to fulfill certain requirements for the funding to be considered a scholarship. If all of the requirements were not met, all or some prorated amount of the funding would have to be paid back.

As we have discussed, one of the more significant benefits of Tech Prep is that part of a recruit's college degree is earned through Navy technical training, which means that he or she does not have to pay tuition for the full 2 years. In essence, this makes the Navy Tech Prep program a type of scholarship. But a loan/scholarship incentive goes further to help to finance that part of the degree that a recruit must complete before going on active duty. This assistance could be quite attractive, given the fact that, while college enrollment rates have been on the increase, the financial burden of earning a college degree has also increased. Consider the following [20]:

- The inflation-adjusted cost of tuition at public 4-year institutions increased 113 percent between 1988-89 and 1998-99, and 114 percent for private 4-year institutions.
- While total aid is higher now than it was a decade ago, the greatest growth in aid has been in the form of loans that must be repaid. In 1980-81, loans made up 40 percent of all aid, compared to 58 percent for 1998-99.

But what is the right amount of the loan, and who should be eligible? The optimal amount of the scholarship would need to be determined, but we recommend something in the range of $4,000 per semester. The amount of the scholarship should be based on considerations that include benefiting both the Navy and the potential recruit.

Let's look at it from the perspective of the potential recruit. For the academic year 1999-00, the average tuition and fees charged by 2-year public and 2-year private institutions were $1,627 and $7,182, respectively. In addition, the average expenses for books and supplies were about $650 for both types of institutions. Finally, the costs for board,

transportation, and other expenses average $4,327 for 2-year public and $4,097 for 2-year private institutions [20].

These totals do not necessarily include all of the costs of attending college. For instance, students who attend college full-time forgo earnings in lieu of attending college. Also, many community college students require loans and/or employment to support them while pursuing their education. The American Association of Community Colleges and ACT conducted a survey in 1998 in which half the students surveyed responded that availability of financial aid is an important consideration in attending a community college—nearly one-third say they could not have attended without financial aid [21]. Thus, a Navy scholarship should have some appeal.

From the Navy's perspective, the money invested in a scholarship has numerous benefits:

- This incentive may increase the pool of potential enlisted contracts beyond the Tech Prep incentive alone (i.e., the larger college-bound high school graduate market).
- More recruits could also be obtained by simply offering more bonuses, either to include more ratings or larger amounts for critical ratings. But money spent on a college incentive also benefits the Navy by bringing in a recruit with a stronger technical and academic preparation for Navy technical training. Thus, the scholarship investment may also save in academic attrition.
- High school graduates who have chosen enlisting in the Navy over pursuing a college degree may be encouraged to extend their time in the DEP until the winter in order to complete 1 semester of college. If enough HSDGs can be enticed with such an incentive, the Navy's efforts to level-load accessions will be benefited. The cost of the summer surge is significant.
- Many of the Sailors who would earn college credit using this incentive might have used tuition assistance or PACE to earn the same number of credits while on active duty, in the absence of such an incentive. According to [14], in FY98, the average cost for each completed instructor PACE course[18] was $185, $475 for each technology Pace, and $189 for each TA course

completed. Thus, the average cost to the Navy for a Sailor to complete five courses on active duty would range between $925 (for all instructor PACE) and $2,375 (for all technology PACE).

- High school dropouts who have 1 semester of college are considered to be high school graduates for recruiting purposes. This type of incentive could expand the pool of high school graduates if it were offered to dropouts as well as graduates. Accessions who currently enter with 1 semester of college may not be similar to those who would be recruited under such an incentive because the reason for going to college and dropping out of college would be quite different. But the college experience may help both kinds of recruits in terms of attrition. Those dropouts who entered with 1 semester of college in FY97-98 had lower 6-month attrition than true dropouts or those with GEDs.[19]

For these reasons, we would urge the Navy to consider offering a generous loan/scholarship incentive with the following provisions:

- It should be widely available—and not open just to Sailors in the most critical ratings.
- It should be in addition to—not in lieu of—any bonus amount for which the recruit is eligible. The additional benefits of the recruit attending college may justify the additional costs.
- The cap on such an incentive needs to be calculated. There will be diminishing returns to someone in DEP taking additional semesters. In particular, the closer he/she gets to graduation, the greater the gap between civilian starting salaries and military pay.

The recoupment of the loan segment of the incentive should be outsourced to an institution that has expertise in recovering student

18. The number of credits earned in the average course is the weighted average of the number of credit hours for each course taken. This average is around 3 credits per course.

19. The 6-month attrition for 1-semester dropouts, true dropouts, and GEDs was 22.4, 25.3, and 23.8 percent, respectively. (Source: CNA's Enlisted Master File.)

loans (e.g., Sallie Mae). As long as the fee charged by an institution—typically in a percentage of the original loan amount—is less than the percentage of loans that the Navy would not recoup, on its own, the Navy is better off by outsourcing this function. For instance, if the Navy was charged 10 percent on every $4,000 loan by the institution, the Navy would recover $3,600 on each loan. Currently, the Navy's recovery of costs of failed TA courses is only 71.3 percent [14]. If the same recovery applied to the $4,000 scholarship, the Navy would be able to recoup, on average, only $2,852.

Conclusions

The Navy Tech Prep agreements that have been forged in the past year are the result of the hard work of a relatively small number of Navy (CNRC, N13, and CNET) and community college personnel. In some cases, EdSpecs have had to devote extraordinary time and resources without having an agreement materialize. Some of their time has been spent on redundant efforts that could have been more streamlined at the headquarters level, such as in creating presentations and marketing materials.

Creating agreements is not all that is required. Even though more than 50 agreements have been signed this year, just 16 Tech Prep recruits have resulted. While the Navy's Tech Prep program is a long-term investment that will require a few years for full benefits to materialize as high school students become enrolled in the program and eventually join the Navy, immediate benefits can accrue from recruiting currently enrolled community college students. EdSpecs and N13 personnel have done most of the work from the Navy's side, and CNRC has put a greater emphasis on creating partnerships than on populating the program with recruits. The subsequent recruiting for this program is the responsibility of enlisted recruiters. Recruiters and support personnel are too stretched in their attempts to meet the current recruiting mission to be able to devote adequate time to be trained in this program, or to recruit to it. Navy Tech Prep remains unfunded, and CNRC does not have the resources either to create sufficient supporting materials or to expand the program at a rapid pace.

For the Navy to meet its increasing requirements for high-quality, technically prepared enlisted recruits, it will have to invest in establishing new incentives to attract college-bound high school graduates. Ultimately, these college-bound students will sort themselves into one of three groups: 2-year college graduates, 4-year college graduates, or college dropouts.

- The majority of 4-year graduates who have a positive propensity to join the Navy will enter the officer ranks and, therefore, are lost to enlisted recruiting.
- For those completing a 2-year degree, their current job opportunities are usually much more lucrative than military service. They would need to have a fairly high propensity to enlist in order to discount the financial discrepancy. But historically, the Navy has recruited less than 400 of the more than 540,000 yearly graduates.
- The job market opportunities for those who become college dropouts may still be much more lucrative than military service. But once they become dropouts, they become more difficult for Navy recruiters to contact.

So, it is much easier to sell the Navy message to this group of people while they are still in high school. But the Navy must offer the college-bound high school market an attractive option for combining military service and earning a college degree.

Tech Prep is an excellent opportunity to do both. In addition, it allows recruits to attend college before joining the Navy, thus preparing them for technical Navy training better than high school alone. And partnerships forged with community colleges under Tech Prep can have secondary benefits, such as recruiting pretrained graduates, thereby reducing the costs to the Navy for training.

The goodwill and enthusiasm of college personnel will not be sustained if they perceive that the Navy is not committed to supporting and recruiting for these programs. Benefits accrue to the colleges and to the Navy only when students enroll. Without adequate support, the benefits from Tech Prep that could accrue to the Navy will be jeopardized.

To ensure success of Tech Prep, recruiting personnel will require targeted resources to support their efforts in creating, expanding, and maintaining these partnerships. Therefore, to ensure the long-term viability of Navy Tech Prep, we recommend that a steering group be created of representatives from CNRC, N1, CNET, and N7 to coordinate, resolve issues, and secure funding. Tech Prep is primarily a

recruiting program, but, as we have argued, the benefits extend beyond recruiting. In addition, because significant overlap exists, both Tech Prep and the Navy College Program could benefit from coordinated efforts.

Appendix A: Description of Tech Prep participation in various states

Florida

For academic year 1997-98, approximately 16 percent of all college-bound high school graduates were involved in Tech Prep, as identified in the state's Readiness for College database. This represents a total of *7,174 secondary students.* Florida requires that all college-bound degree-seeking students take a college placement test to determine whether remediation is necessary in math, reading, and writing. Preliminary findings indicate that the Tech Prep graduates had a slightly higher pass rate on these tests than all other college-bound degree seeking students (60.6 versus 58.5 percent) [22].

Massachusetts

In 1997-98, Tech Prep consisted of more than 8,000 students. The enrollment of juniors and seniors in the participating high schools was approximately 8 percent. In addition, over 60 percent of the 1998 graduating Tech Prep high school students enrolled in postsecondary education upon graduation [23].

New York

According to the state's 1997-98 Annual Report, 41,500 *students* were enrolled in Tech Prep in New York State that academic year, which represents a 1.5-percent increase from the previous year.

New York is one state that invests a significant amount of state-level funding for Tech Prep. For instance, in academic year 1995-96, the New York State Department of Education provided $5.3 million to Tech Prep, and an additional $9.5 million was provided in matching funds from local, state, and federal sources [24].

North Carolina

Forsyth Technical Community College, the fifth largest community college in North Carolina with a full-time enrollment of 6,000 students, reports a 1999-00 academic year enrollment of 343 high school Tech Prep graduates [25].

All of the colleges in North Carolina have at least one articulation agreement with local community colleges, and most of them have multiple arrangements. For instance, 47 of the 58 community colleges offer an articulated high school Tech Prep program in Electrical/Electronics Technology [26].

Ohio

A total of 835 *college* Tech Prep students were enrolled in Ohio in the fall of 1998. That year, Ohio reported a total of 44 public colleges and universities, 400 secondary school districts, and 600 business/industry/labor representatives in 26 Tech Prep consortia. The state's objective is to have 15 percent of all 11th and 12th grade students in Ohio public education enrolled in Tech Prep by the year 2000 [27].

One consortium in Ohio, the North Central Tech Prep consortium, offers three separate scholarships for graduating high school Tech Prep students to enroll in North Central Technical College. One scholarship provides $1,000 for the first year of studies, the second pays all instructional and general fees for up to 110 credit hours at the college, and the third offers $2,000 per year for 2 years [28].

Pennsylvania

From academic year 1995-96 to 1997-98, the number of Pennsylvania Tech Prep programs increased 200 percent—from 78 to 235. In that same period, the number of *secondary* students enrolled in Tech Prep increased 100 percent—from 2,055 to 4,197 [29].

Tennessee

The 1999 state Tech Prep conference was held in mid-November in Gatlinburg. The conference was funded in part by state Tech Prep funds, so no conference fee was charged. This may have contributed

to the fairly large participation in the conference, which attracted more than 1,400 people. In the opening remarks, it was noted that the state has 112 articulated Tech Prep programs and that three 4-year colleges have A.A.S. to B.S. Tech Prep articulation agreements: East Tennessee State University, the University of Memphis, and Tennessee Technical University [30].

Texas

In academic year 1997-98, Texas had 69,000 *secondary* students enrolled in Tech Prep in 505 approved programs, which represents 6.5 percent of the total high school enrollment in Texas, and 11.4 percent of all 12th graders. The total enrollment represents an increase of 165 percent since 1994-95. They also report that in 1997-98, there were 65,000 Tech Prep students in *postsecondary* programs [31].

Virginia

A 1998 survey of 19 of Virginia's 26 Tech Prep consortia identified more than 6,623 *graduating high school* Tech Prep students. Of these, 65 percent stated that their plans upon high school graduation were to attend college. Currently, community college enrollment in Virginia is at an all-time high [32].

Fairfax County

Fairfax County, located in northern Virginia, is the nation's twelfth largest school district. A core, or standard, program of professional technical studies courses is offered in every Fairfax County Public middle and high school. These studies are in six program areas, which are closely related to the Federal Tech Prep career areas: Business, Health Occupations, Industrial Technology, Marketing, Trade and Industrial, and Work and Family Studies.

Over 23,000 *secondary* students were enrolled in these courses in the 1998-99 academic year. Technical and specialized elective courses in International Studies and Business, Engineering and Science Technology, Health and Human Services, and Communication Arts are available at four Fairfax County high schools.

Articulation agreements exist between Fairfax County Public Schools (FCPS) and Northern Virginia Community College, Computer Learning Center, Johnson & Wales University, and Stratford College. These agreements allow students to receive advanced placement credit for courses taken in these professional technical studies courses while in high school, or for certain college courses to be waived by passing an assessment test. For instance, students can earn up to 6 college credits in Information Systems Technology from Northern Virginia Community College in 25 of the county's 26 high schools [33].

Fairfax County is one example of why it is often difficult to determine precisely the number of Tech Prep students across the nation. Rather than Tech Prep, Fairfax calls its program "Professional Technical Studies," but this broad program includes Tech Prep programs. However, they choose not to call the entire program Tech Prep because not all courses have articulation arrangements with local community colleges, and not all middle and high school students enrolled in these courses will choose to continue their studies in that field in college or seek employment in that field.

West Virginia

A new West Virginia law requires all 9th graders to choose a cluster to pursue during the remainder of their high school education, and all students by the end of 10th grade must identify a major within that cluster. Each of these majors is differentiated by a level of proficiency—professional, skilled, or entry level. All students choosing the skilled level are Tech Prep students.

Because this law is new, statewide statistics concerning enrollment in Tech Prep clusters is not available. However, a few lead counties chose to start implementation ahead of schedule. A recent survey of these counties found that 26 percent of 12th graders, and 36 percent of 11th graders are enrolled inTech Prep [16].

Appendix B: List of colleges with agreements signed or pending

Table 5 lists the colleges, by state, that have signed formal agreements with the Navy.

Table 4. Colleges, by state, with Tech Prep agreements

State/College
Delaware
Delaware Technical and Community College at Owens
Delaware Technical and Community College at Terry
Delaware Technical and Community College at Stanton
Illinois
John A. Logan College
Maryland
Howard Community College
Nebraska
Central Community College
Metropolitan Community College
Mid Plains Community College
Northeast Community College
Southeast Community College
Western Nebraska College
Oklahoma
Cameron University
Carl Albert State College
Connors State College
Eastern Oklahoma State College
Murray State College
Northeastern Oklahoma A&M College
Northern Oklahoma College
Oklahoma City Community College
Oklahoma Panhandle State University
Oklahoma State University, Oklahoma City
Oklahoma State University Technical Branch, Okmulgee
Redlands Community College
Rogers State College
Rose State College
Seminole Junior College
Southwestern Oklahoma State University at Sayre
Tulsa Junior College
Western Oklahoma State College

Table 4. Colleges, by state, with Tech Prep agreements (continued)

State/College
Oregon
Mt. Hood Community College
North Carolina
Guilford Technical Community College
Pennsylvania
Northampton County Area Community College
Tennessee
Walters State Community College
Texas
Brookhaven College
Cedar Valley College
Eastfield College
El Centro College
Mountain View College
North Lake College
Richland College
San Antonio Community College
Utah
Salt Lake City College
Virginia
Mountain Empire Community College
Tidewater Community College
West Virginia
Bluefield State College
Shepherd College
Eastern WV Community andTechnical College
Southern WV Community andTechnical College
Fairmont State College
WVU at Parkersburg
Glenville State College
WVU Institute of Technology

Table 4. Colleges, by state, with Tech Prep agreements (continued)

State/College
West Virginia (continued)
Marshall University
WV Northern Community College
Potomac State College of WVU
West Virginia State College

Appendix C: Sample articulation agreement—Mountain Empire Community College

Articulation of the Electronics EngineeringTechnology Program Between Mountain Empire Community College and the United States Navy

Per agreement between Mountain Empire Community College (MECC), on behalf of the Mountain Empire Tech Prep Consortium, and the United States Navy, Mountain Empire Community College will award college credit for specific Naval training courses in partial fulfillment of program requirements leading to the Associate degree of Electronics Engineering Technology (EET). These credits will be awarded only when all the conditions of articulation have been met, as stipulated below.

Articulation is a delineated process that awards college credit for certain courses completed elsewhere. This articulation agreement between MECC and the U.S. Navy allows students who meet the criteria, specified below, to receive college credit for the instruction and training they have received in U.S. Navy Training programs and their related job experience. Completion of both portions of the college coursework—preliminary studies at MECC and successful program completion through formal Navy Training curricula and job experience (as accredited by the American Council on Education (ACE)—is required before the student is eligible to receive the EET Associate degree from Mountain Empire Community College.

General Requirements for Articulation:

- All articulation students shall:
  - meet and maintain the prerequisites and academic standards of MECC and the intended program of study. In

addition, in order for students to be eligible for a degree under this program, they must maintain all eligibility requirements for the Navy program for which they enlist. Failure to meet eligibility requirements for either the MECC or the Navy programs of study/career path or failure to successfully complete the Navy Training program (for any reason) required for degree completion will make the student ineligible for the degree via the path outlined herein.

— attain placement scores appropriate for entry into English 111 and Math 105 or 163 (refer to MECC catalog), or successful completion of these courses through Dual Enrollment.

— be enrolled at MECC as a student in the Electronic Engineering Technology Program, and complete at least 25% of the total credits at MECC (some of which may be completed during high school through Dual Enrollment and/or through articulation of courses taken as part of a Tech Prep career pathway) prior to commencing Navy training. Any remaining course requirements which have not been taken either at MECC or fulfilled by Navy training or related job experience may be taken at another Community College site to meet degree requirements, subject to approval by the MECC Office of Admissions and Records, as long as all other conditions of this agreement have been met.

- Students transferring into the Navy's Advanced Electronic Computer Field or Nuclear Field to continue their training with the intent of obtaining an Associate degree in EET from MECC must do so within 2 years of completion of the residence portion of the program requirements (25% of the total credits to be taken at MECC which can include articulated Tech Prep or dual enrollment high school courses), or receive approval from MECC.

- Prior to being awarded the Associate degree, the student must submit evidence of completion of the Navy portion of the coursework in order to receive college transfer credit for Navy

training. This must be in the form of a signed certification from the Navy indicating successful completion of the Navy training, accompanied by appropriate standard documentation from the student's Command (specifying course and completion status). The student is responsible for submitting standard Navy documentation to Mountain Empire Community College after the completion of each phase of Navy training. The Navy is responsible for notifying MECC if a student becomes ineligible for the degree either through academic drop or loss of eligibility for the Navy program.

The separate areas of specialization included in this articulation agreement that lead to the Associate degree in Electronics Engineering Technology upon completion of the articulation requirements are listed in Addendum 1, along with the specific course requirements and the number of credits awarded for both the MECC and the Navy portions of the program.

This agreement shall remain in effect as long as the conditions of the agreement are met by both parties, subject to reevaluation at the request of either party. The Navy is responsible for notifying MECC of any curriculum changes in the Navy training program which will clearly result in a lower number of recommended credits from the American Council on Education (ACE) or significantly deviate from the original concentration of study. MECC will initiate review of this agreement biannually for applicability and change as deemed necessary.

We, the undersigned, agree to the terms of this articulation agreement, to begin on this date of February 25, 1999.

Addendum 1 to Tech Prep Agreement between
Mountain Empire Community College and the U.S. Navy

Twenty-five percent of the required credits for the Associate degree in Electronics Engineering Technology from Mountain Empire Community College must be from the degree granting institution. Some of these requirements can be met during high school through dual enrollment (courses denoted * below), and/or articulation through the Tech Prep program (courses denoted ** below). Those students who have sufficient dual-enrollment and Tech Prep articulated credits

can fulfill the remaining course requirements in one semester at MECC.

Those credits that need to be taken at MECC or during high school are as follows:

MECC Courses in Residence

6 credits in English*
6 credits in Social Sciences*
3 credits Math 163 (Precalculus)* or
4 credits in Technical Math 105-106
4 credits ETR 113 DC and AC Fundamentals**
4 credits ETR 166 Fundamentals of Computer Technology
1 credit ETR 100 Electronic Problem Solving Laboratory
1 credit STD 100 Student Orientation

MECC Equivalent Courses (Credit awarded for Navy training)

ETR 114 AC/DC Fundamentals I	4 credits
ETR 143 Devices and Applications I	3 credits
ETR 167 Logic Circuits and Systems I	4 credits
ETR 256 Devices and Circuit Design I	4 credits
ETR 273 Computer Electronics I	4 credits
ETR 257 Devices and Circuit Design II	4 credits
ETR 259 Linear Integrated Circuits	4 credits
ETR 274 Computer Electronics II	4 credits
ETR 241 Electronic Communications I	3 credits
ETR 258 Devices and Circuit Design III	4 credits
ETR 275 Computer Electronics III	4 credits
HLT or PE electives	2 credits
Total equivalent credits awarded for Navy training:	44 credits

These courses will appear on the student's transcript at MECC as credits articulated through the Tech Prep Navy articulation agreement.

ADVANCED ELECTRONICS AND COMPUTER FIELD (AECF Electronics Technician (ET))

MECC Training
Courses at MECC to include

6 credits in English*
6 credits in Social Science*
4 credits in Technical Math or 3 credits Math 163 (Precalculus)*
4 credits ETR113 DC and AC Fundamentals**
4 credits ETR166 Fundamentals of Computer Technology
1 credit ETR100 Electronic Problem Solving Laboratory
1 credit STD100 Student Orientation
25-26 MECC credits

Navy Training
3 credits x-777-7770 Recruit Training (Basic Training)
1 credit Personal Fitness/Conditioning
1 credit Personal/Community Health
1 credit First Aid/Safety
12 credits A-100-0139 Combat Systems Technical Core
Electronics Technician/Fire Control Technician
3 credits AC/DC Circuits
3 credits Solid State Electronics
3 credits Digital Principles
3 credits Communication Systems
4 credits A-100-0146 Electronics Technician

Communications Strand
4 credits Communications with Radar endorsement **or** 4 credits A-100-0147 Electronics Technician

Radar Strand
4 credits Radar Theory, Operation and Maintenance (with radio endorsement)

All graduates will receive follow on training from one of the schools listed below:

6 – 12 credits:

NEC	Course ID #	Title	Total credits	ACE pg.
1413	C-198-2010	Meteorologist Equipment 3 credits Electronic Systems Troubleshooting 3 credits Computer Systems Troubleshooting	6	241
1415	A-101-0227	Combined Shore Maintenance 6 credits Electronic Systems Troubleshooting	6	215
1427	A-101-0263	Tactical Data Systems 3 credits Electronic Systems Troubleshooting 3 credits Computer Systems Troubleshooting 3 credits Advanced Computer Systems and Organization	9	34
1454	A-101-0096	DD963 Communications 3 credits Communication Systems Maintenance 3 credits Communication Systems 2 credits Communication Systems Laboratory	8	202
1491	A-102-0295	FFG7 Navigation 8 credits Radar Systems Troubleshooting	8	200
1493	J-101-0817	Tac Sup Com 2 credits Computer Systems Troubleshooting 2 credits Electronic Systems Troubleshooting 2 credits Data Communications Systems	6	193
1494	A-101-0234	LHD Radio 1 credit Computer Systems and Organization 6 credits Electronic Systems Troubleshooting	7	35
1572	A-102-0062	AIMS Systems Technician 3 credits Digital Circuit Logic 3 credits Analog Circuits 3 credits Communications Circuit Analysis	9	200
1657	J-102-0393	ASWM FTAS 6 credits Computer System Maintenance and Repair 3 credits UNIX System Administration 3 credits Telecommunication Systems & Repair	12	194
1685	J-102-0364	ASWO FTAS 3 credits Computer Systems Troubleshooting 3 credits Electronic Systems Troubleshooting	6	28

All graduates are advanced to E-4 upon completion of the last school. ACE recommends the following credit for advancement:

14 credits

3 credits Basic Electronics Laboratory
2 credits Digital Principles
3 credits Electronic Systems Troubleshooting and Maintenance
2 credits Technical Math
1 credit Control Systems
1 credit Electronic Communications
1 credit DC Circuits
1 credit AC Circuits

Total Navy credits earned: 39, 40, 41, 42 or 45

39 credits minimum for Navy training
5 credits for Navy Occupational Experience
69-70 credits total minimum

ADVANCED ELECTRONICS AND COMPUTER FIELD (AECF Fire Controlman (FC))

MECC Training
Courses at MECC to include

6 credits in English*
6 credits in Social Science*
4 credits in Technical Math or 3 credits Math 163 (Precalculus)*
4 credits ETR113 DC and AC Fundamentals**
4 credits ETR166 Fundamentals of Computer Technology
1 credit ETR100 Electronic Problem Solving Laboratory
1 credit STD100 Student Orientation
25-26 MECC credits

Navy Training

3 credits x-777-7770 Recruit Training (Basic Training)
1 credit Personal Fitness/Conditioning
1 credit Personal/Community Health
1 credit First Aid/Safety

12 credits A-100-0139 Combat Systems Technical Core

Electronics Technician/Fire Control Technician
3 credits AC/DC Circuits
3 credits Solid State Electronics
3 credits Digital Principles
3 credits Communication Systems

9 credits A-100-0141 Fire Controlman Class 'A' Strand
3 credits Motor Control Lab
3 credits Electromechanical Systems
3 credits Servo Control

All graduates will receive follow on training from one of the schools listed below:

9 – 14 credits:

NEC	Course ID #	Title	Total credits	ACE pg.
1102	A-113-0080	MK92 3 credits Computer Systems Troubleshooting 3 credits Electronic Systems Troubleshooting 3 credits Radar Systems 3 creditys Computer Systems and Organization	12	194
1106	S-104-0192	MK99A 4 credits Computer Systems Troubleshooting 4 credits Electronic Systems Troubleshooting 4 credits Computer Interface and Peripheral Sys	12	166
1107	S-104-0191	AN/SPY-1A 3 credits Digital Logic and Computer Interfacing Technology 4 credits Radar Systems 3 credits Electronic Systems Troubleshooting	10	165
1119	S-104-0210	AEGIS Radar Systems Technician 3 credits Digital Logic and Computer Interfacing 4 credits Radar Systems 3 credits Electronic Systems Troubleshooting	10	220
1127	A-113-0078	CIWS Mod 0 3 credits Servo System Maintenance 4 credits Computer Control 3 credits Radar Maintenance	10	193

NEC	Course ID #	Title	Total credits	ACE pg.
1143	S-104-0211	MK99 3 credits Digital & Microprocessor Applications 2 credits Computer Peripherals Maintenance 4 credits Electronic/Electromechanical Systems Troubleshooting	9	220
1147	A-104-0204	NATO Sea Sparrow 3 credits Electronics Systems Troubleshooting 3 credits Computer Systems Troubleshooting 2 credits Computer Systems and Organization 3 credits Radar Systems 3 credits Applied Control Systems	14	177
1323	A-113-0174	AGFS MK86 3 credits Electronic Communications 3 credits Radar Systems 3 credits Electronic SystemsTroubleshooting	9	233
1624	A-150-0261	AN/UYQ-21 3 credits Computer Systems Troubleshooting 3 credits Electronic SystemsTroubleshooting	9	35

All graduates are advanced to E-4 upon completion of the last school. ACE recommends the following credit for advancement:

6 credits

3 credits Basic Electricity/Electronics
3 credits Applied Mathematics

Total Navy credits earned: 39, 40, 42 or 44

39 credits minimum for Navy training
5 credits for Navy Occupational Experience
69-70 credits total minimum

NUCLEAR FIELD ELECTRONICS TECHNICIAN (NF ET)

MECC Training
Courses at MECC to include

6 credits in English*
6 credits in Social Science*

4 credits in Technical Math or 3 credits Math 163 (Precalculus)*
4 credits ETR113 DC and AC Fundamentals**
4 credits ETR166 Fundamentals of Computer Technology
1 credit ETR100 Electronic Problem Solving Laboratory
1 credit STD100 Student Orientation
25-26 MECC credits

Navy Training

3 credits x-777-7770 Recruit Training (Basic Training)
1 credit Personal Fitness/Conditioning
1 credit Personal/Community Health
1 credit First Aid/Safety

20 credits A-661-0105 Nuclear Field Electronics Technician 'A' School
3 credits DC Circuits
3 credits AC Circuits
4 credits Solid State Devices
3 credits Electrical Troubleshooting
4 credits Digital Microprocessors
3 credits Technical Math (Algebra II)

30 credits A-661-0010 Nuclear Power School
5 credits General Physics
3 credits Heat Transfer and Fluid Flow
3 credits Nuclear Reactor Engineering
1 credit Atomic and Nuclear Physics
1 credit Radiation Protection Technology
3 credits General Chemistry and Principles of Materials
4 credits Technical Math (Algebra & Trig)
2 credits Hydraulic Systems
2 credits DC Circuits
2 credits AC Circuits
2 credits Digital Principles
2 credits Electric Machines

All Nuclear Field 'A' School graduates are advanced to E-4 upon completion of the school. ACE recommends the following credit for advancement:

14 credits

3 credits Basic Electronics Lab
2 credits Digital Principles
3 credits Electronic Systems Troubleshooting
2 credits Technical Math
1 credit Control Systems
1 credit DC Circuits
1 credit AC Circuits
1 credit Electronic Communications

Total Navy credits earned: 67

67 credits for Navy training
92-93 credits total

NUCLEAR FIELD ELECTRICIAN'S MATE (NF EM)

MECC Training
Courses at MECC to include

6 credits in English*
6 credits in Social Science*
4 credits in Technical Math or 3 credits Math 163 (Precalculus)*
4 credits ETR113 DC and AC Fundamentals**
4 credits ETR166 Fundamentals of Computer Technology
1 credit ETR100 Electronic Problem Solving Laboratory
1 credit STD100 Student Orientation
25-26 MECC credits

Navy Training

3 credits x-777-7770 Recruit Training (Basic Training)
1 credit Personal Fitness/Conditioning
1 credit Personal/Community Health
1 credit First Aid/Safety

20 credits A-661-0104 Nuclear Field Electrician's Mate 'A' School
- 3 credits DC Circuits
- 3 credits AC Circuits
- 4 credits Electrical Machinery
- 3 credits Electrical Troubleshooting
- 4 credits Basic Electricity
- 3 credits Technical Math (Algebra II)

30 credits A-661-0010 Nuclear Power School
- 5 credits General Physics
- 3 credits Heat Transfer and Fluid Flow
- 3 credits Nuclear Reactor Engineering
- 1 credit Atomic and Nuclear Physics
- 1 credit Radiation Protection Technology
- 3 credits General Chemistry and Principles of Materials
- 4 credits Technical Math (Algebra & Trig)
- 2 credits Hydraulic Systems
- 2 credits DC Circuits
- 2 credits AC Circuits
- 2 credits Digital Principles
- 2 credits Electric Machines

All Nuclear Field 'A' School graduates are advanced to E-4 upon completion of the school. ACE recommends the following credit for advancement:

9 credits
- 2 credits Basic Electronics Lab
- 5 credits Electrical Systems Troubleshooting
- 1 credit Basic Electronics
- 1 credit Personnel Supervision

Total Navy credits earned: 62

62 credits for Navy training
87-88 credits total

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